

ITCO-TYPE JUNK BASKETS

Instruction Manual 3050



Itco-Type Junk Baskets

One Company Unlimited Solutions



NATIONAL OILWELL VARCO

Itco-Type Junk Baskets

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The designs and specifications for the tools described in this instruction manual were in effect at the time this manual was approved for printing. National Oilwell Varco, whose policy is one of continuous improvement, reserves the right to discontinue models at any time, or to change designs and specifications without notice or without incurring obligation.

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General Description

The **Bowen Itco-Type Junk Basket** is an uncomplicated yet dependable fishing tool for retrieving all kinds of loose junk. Its simplicity of design, construction, operation and maintenance is such that any drilling crew can use it successfully. With free revolving double catchers, magnet inserts and accessory shoes, the Bowen Junk Basket is indispensable equipment on a rotary drilling rig.

Use

The **Bowen Itco-Type Junk Basket** is used to retrieve all sorts of junk that may accumulate at the bottom of a well and which may impede drilling progress. This junk may be such objects as rock bit cones, bearings, broken slips, bits of wire line, various hand tools, slivers and debris from twisted off drill string, milling cuttings, etc. It may also be used to take a core sample, drill a full gauge hole or to ream the hole.

Construction

The **Bowen Itco-Type Junk Basket** consists basically of a Barrel, a Top Sub, an Upper Catcher, a Lower Catcher, and a Type "A" Mill Shoe. This type shoe is faced with conventional hard metal on the cutting surfaces. Accessories include Magnet Inserts, Mill Shoes dressed with Itcoloy and Finger Shoes. The two catchers employ rivet-free construction, easily redressed on location. Catcher Fingers are cast from strong, long wearing manganese bronze or steel. The Fingers in the Upper Catcher extend only half way to the center, its function being to break the core when an upward strain is taken on the string. The Lower Catcher has alternately long and short fingers which extend almost to the center, forming a close fitting basket which will retain the core or small pieces of junk. Both Catchers are free to revolve within the Shoe, eliminating Finger breakage.



Junk Basket
Lower Catcher



Junk Basket
Upper Catcher



Bowen Itco-Type Junk Basket
Dressed with a Type A Mill Shoe

Accessories

Mill Shoes

The Bowen Itco-Type Junk Basket is furnished with a standard **Type "A" Mill Shoe**. This is a mill type shoe with side wings and is ideal when used in softer formations. It is recommended that Itcoloy-faced Mill Shoes be considered when harder formations are encountered.

The **Type "B" Mill Shoe** is similar in design to the Type "A" but is hard faced with Itcoloy. Itcoloy is a material composed of sintered tungsten carbide is an extremely tough matrix which will effectively and rapidly mill up junk during the fishing operation. It is ideal when the cutting of hard formations is required.

The **Type "C" Mill Shoe** is a flat bottomed shoe which is hard faced with Itcoloy on the bottom, on the inner face and on the outer face. It will effectively mill up junk and is especially effective for cutting cores. This is a burning type shoe for cutting metal.

Finger Shoe

When junk is lying loose on the bottom of the well or when junk is too large to pass through the Catchers, a **Finger Shoe** may be installed on the bottom of the Barrel in place of the Mill Shoe. When the Junk Basket engages the fish, combined rotating and lowering cause the long fingers to close in beneath the fish and retain it in the Barrel. Finger replacements are easy and inexpensive to replace on the Shoe Body.

Magnet Inserts

Magnet Inserts are available to convert Bowen Junk Baskets into effective fishing magnets. The Magnet Insert is machined to fit into the recess normally occupied by the two Catchers. The Magnet Insert is used especially when in hard-to-drill formations and to thoroughly clean the hole prior to diamond drilling.



Bowen Itco-Type Junk Basket with Magnet Insert



Magnet Insert



Finger Shoe



Type A Mill Shoe



Type B Mill Shoe



Type C Mill Shoe

Operation

First determine that the Bowen Itco-Type Junk Basket is properly assembled and that all parts are in good working order. (see "Reassembly")

Select the proper shoe:

If the junk is large and lying loose on the bottom, use the Finger Shoe.

If the formation is relatively soft and the fish is loose, use a Type "A" Mill Shoe.

If the formation is hard or the fish is imbedded in the formation, use either the Type "B" or Type "C" Itcoloy-faced Mill Shoe. Also, these hard faced shoes will cut away protruding excess metal to allow free entry of the junk into the basket.

Connect the assembly to the drill string and run it into the hole. Just before reaching bottom, start circulation at reduced pressure, begin rotation and slowly lower to contact the fish and bottom. Continue to rotate as weight is increased, permitting the Shoe to penetrate the information. Penetrating the formation forces the junk completely into the Barrel and cuts a short core.

After the core is cut, stop rotation and circulation, release the torque from the string, then take an upward strain to break the core. A Bowen Hydraulic Jar made up in the string above the Bowen Junk Basket will aid in quickly breaking the core.

As soon as the core is broken, the string and Basket may be removed from the well.

At the surface, break the joint between the Shoe and the Barrel, remove the Shoe and empty the Basket.

NOTE:

When using Mill Shoes, maintain a ton of weight and rotate the Basket at a mill cutting rate of 50 to 150 rpm.

When using Finger Shoes, rotate and lower slowly until approximately two tons of weight is against the bottom.

Maintenance

The Bowen Itco-Type Junk Basket is a relatively simple tool to maintain. For best operation and long service life the following procedure should guide the operator:

1. After use, the Junk Basket should be completely disassembled and cleaned (see "Disassembly")
2. Inspect and replace as may be required any small parts, such as springs and fingers, that may be damaged.
3. Reassemble, greasing each internal part as it is assembled.
4. Dry and dope threaded connections as they are assembled.
5. After complete assembly, the entire outside of the Junk Basket should be painted or thoroughly greased, to prevent deterioration.

Disassembly

1. Break the threaded joints between the Top Sub and Barrel, and between the Barrel and Shoe. This may best be done at the rig as the Junk Basket is removed from the hole.
2. Remove the Shoe from the Barrel. If the assembly is a large one, it may be necessary to use a lifting sub and large pipe vise to facilitate handling. If the Junk Basket is disassembled in horizontal position in a vise, care should be taken that the Catchers do not fall out as the Shoe is removed.
3. Lift out the two Catchers (or Magnet Insert) with their retrieved junk.
4. Remove the Top Sub from the Barrel.

5. If the Junk Basket is to be used again, immediately inspect the Catchers to assure they are not damaged and that all the Fingers work properly. If any damaged is found, disassemble and replace the damaged parts, or use a spare Catcher. (see "Redressing Catcher Assemblies")
6. Thoroughly clean and lubricate all internal parts, and the interior of all the outside parts.

Reassembly

1. Clamp the Barrel in a pipe vise.
2. Make up the Top Sub to the Barrel.
3. Insert the Lower Catcher into the Shoe. The Lower Shoe is the one with alternate long and short Fingers. Insert the Upper Catcher into the Shoe above the Lower Catcher.

Caution

The Fingers hinge upward in operation. Make sure that both Catchers are installed so that they deflect upward in service. Also make sure that both Catchers are well greased just before assembly, and that both rotate freely in the Shoe.

When the Magnet Insert is used, it is inserted into the same recess as both Catchers, with its bail uppermost.

4. Make up the Shoe and its inserted Catchers (or Magnet Insert) to the lower end of the Barrel.
5. Tighten the two joints.
6. Paint or thoroughly lubricate the entire outside of the Junk Basket to prevent deterioration.

Redressing Catcher Assemblies

To Disassemble the Catcher

Completely disassemble the Catcher. The only tools required are a suitable screwdriver (with a 1/4" blade) and a vise if the Catcher is large.

Referring to the photos on page 7, proceed as follows:

1. Place the Catcher assembly on a work-bench or in a vise, with the Retainer Ring at the top. Do not exert enough force against the Catcher with vise jaws to maul or distort it.
2. Remove the two Retainer Screws.
3. Remove the Retainer Ring. This should be done slowly and with care. The Retainer Ring holds the several Torsion Springs deflected so that when the Retainer Ring is partially disassembled, it will tend to spring off due to the spring load behind it. If it is allowed to spring off unrestricted, parts may be lost or damaged.
4. Remove the Fingers and the Torsion Springs.
5. Remove the Torsion Springs from the Fingers.
6. Remove the Pivot Pins where these are used.
7. Clean all parts thoroughly, and inspect them for damage or excessive wear. Replace any parts not in good service condition.

To Reassemble the Catcher

All Catchers are assembled by the same method, but more care must be taken with the Lower Catcher than with the Upper Catcher to assure that alternate long and short fingers assembled are in the proper sequence.

1. Check the Catcher replacement parts list to assure that the Proper Fingers in correct quantity are being used (*see pages 11–16*). Grease all parts thoroughly.
2. Assemble a Torsion Spring in one of the Long Fingers, so that one leg of the Torsion Spring is inserted into the small hole at the upper end of the Finger, and the other leg of the Torsion Spring is protruding out toward the code letter on the Finger.

NOTE:

Some Catcher assemblies do not have Fingers with integral lugs. These assemblies utilize separate Pivot Pins. Fingers used in these assemblies are assembled with the Torsion Spring maintained in position by the pivot pin.

3. Insert the Finger with its assembled Torsion Spring into any one of the open slots in the side of the Body. The two pilot lugs on the Finger will nest into the smaller cross-slots at the upper end of the Finger slot.

Caution

Be sure to insert the Finger with the code letter toward the outside of the Catcher. These Fingers must be free to revolve inward toward the center of the Catcher when the Retainer Ring is installed, and the Fingers must be free to deflect upward when in service after assembly.

4. Install the first short Finger next to the first long Finger, in the same manner.
5. Install a second long Finger.
6. Continue installation of long and short Fingers, alternately until all have been installed.

After all Fingers have been installed, each Finger will have one leg of the Torsion Spring extending outward approximately 1/4" to 1/2", depending on size. Do not trim off these Torsion Spring legs. They are necessary to the function of the Catcher Fingers.

7. Slip the Retainer Ring over the upper part of the Body, with the two holes at the bottom side. These two holes are 180° apart. They should be aligned with the two tapped holes in the Body.
8. Shove the Retainer Ring down, deflecting the Torsion Spring legs until the bottom edge of the Retainer Ring rests on the series of shoulders near the center of the Body.

NOTE:

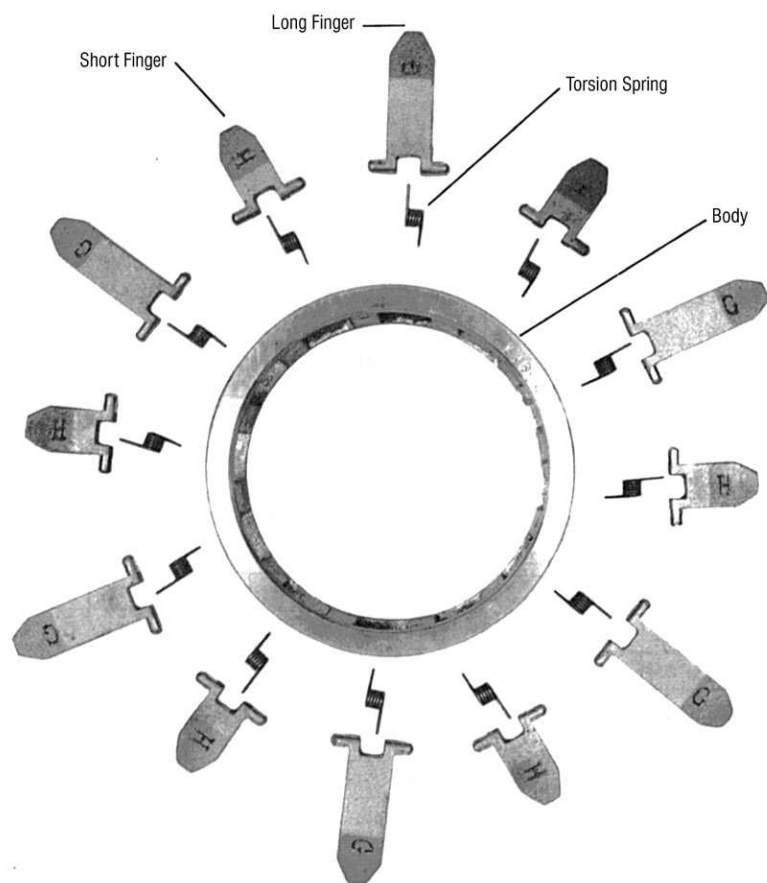
If the Catcher is very large, two people may be required to assemble the Retainer Ring; one maintaining the Fingers and Torsion Springs in place, while the second pushes the Retainer Ring down.

The total force exerted by the Torsion Springs in large Catchers may be too great for one person to comfortable overcome.

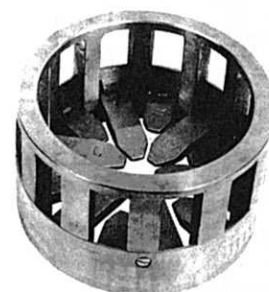
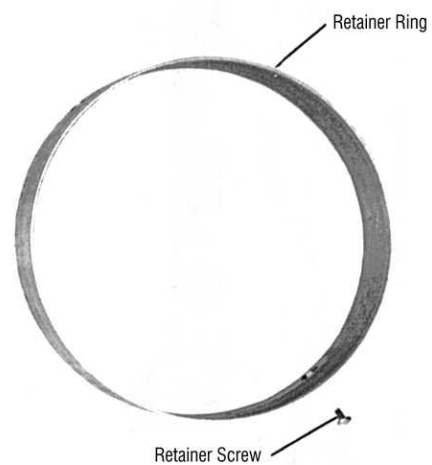
9. Align the two holes in the Retainer Ring, with the two tapped holes in the Body.
10. Insert the two Retainer Screws, and tighten, making sure that the heads are completely centered in the Retainer Ring holes, and does not overlap the edge of the hole.

Do not over-tighten these two screws.
11. Check the action of each of these assembled Fingers to assure proper deflection and retraction.

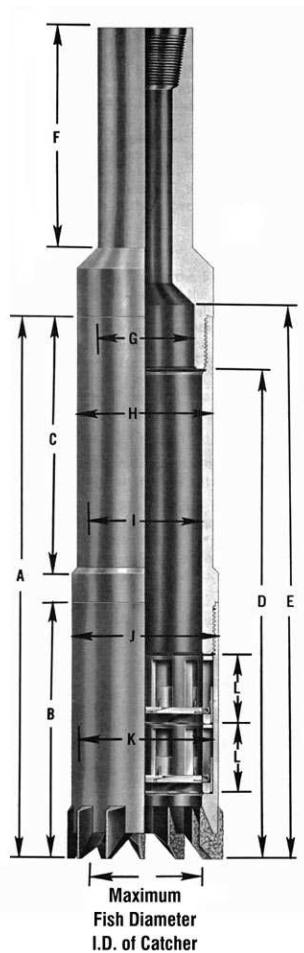
The Catcher is now ready for assembly in the Junk Basket.



**Parts to Assemble
Bowen Junk Basket Catcher**



**Assembled Bowen Junk Basket Catcher
(Lower)**



Principle Dimensions

Part Number	Hole Size	Standard O.D. of Hardfaced Shoe	Max. Fish Dia.	A	B	C	D	E	F	G	H	I	J	K	L
14590	3-3/4 - 4-1/8	3-5/8 - 4-1/8	2-23/32	26-1/4	8-1/4	*	23	26-5/8	†	1-7/8	3-5/8	2-23/32	3-5/8	2-9/32	1-7/8
14586	4-1/4 - 4-1/2	4-1/16 - 4-1/2	2-31/32	26-3/8	8-3/8	15-27/32	23-1/8	26-3/4	†	2-1/8	3-1/4	2-31/32	4-1/16	3-23/32	2-5/16
14595	4-5/8 - 5	4-1/2 - 5	3-9/32	27-1/8	9-1/8	15-11/16	23-7/8	27-1/2	†	2-3/8	3-7/8	3-9/32	4-1/2	4-1/16	2-3/8
19375	4-5/8 - 5	4-1/2 - 5	3-3/8	27	9	15-11/16	23-3/4	27-5/8	13	2-3/8	3-7/8	3-13/32	4-1/2	4-7/64	2-7/16
14600	5-1/8 - 5-1/2	4-1/8 - 5-1/2	3-9/32	26-15/16	8-15/16	51-1/16	23-15/16	27-9/16	†	2-3/4	4-1/4	3-23/32	4-7/8	4-17/32	2-5/8
2618	5-5/8 - 6	5-1/8 - 5-3/4	3-25/32	29-7/8	11-7/8	*	26-5/8	30-5/8	†	3-3/4	5-1/8	3-25/32	5-1/8	4-1/2	2-5/8
14605	5-5/8 - 6	5-3/8 - 6	4-1/16	29-3/16	11-3/16	15-47/64	25-15/16	29-11/16	†	3	4-3/4	4-1/16	5-3/8	4-15/16	2-25/32
2670	6-1/8 - 6-1/2	5-3/4 - 6-1/2	4-3/8	30-1/4	11-15/16	*	47-1/4	31-1/4	†	4	5-3/4	4-13/32	5-3/4	5-5/32	2-13/16
14610	6-1/8 - 6-5/8	5-7/8 - 6-5/8	4-5/16	30-11/16	12-11/16	15-5/8	27-7/16	31	†	3-5/16	5-1/8	4-5/16	5-7/8	5-3/8	2-7/8
19379	6 - 6-3/8	5-7/8 - 6-3/8	4-1/2	30-11/16	12-11/16	15-5/8	27-7/16	28	13	3-1/2	5-1/8	4-7/32	5-7/8	5-15/32	2-7/8
14615	6-3/4 - 7-1/4	6-1/4 - 7-1/4	4-3/16	31-1/4	13-1/4	15-3/4	28	32-1/4	†	3-1/2	5-3/4	4-13/16	6-1/4	5-3/4	3-1/16
14620	7-3/8 - 8-1/4	7-1/8 - 8-1/4	5-7/16	31-3/4	13-3/4	15-11/16	28-1/2	31-3/4	†	4-5/8	6-1/2	5-7/16	7-1/8	6-7/16	3-5/16
14625	8-3/8 - 9 1/4	8-1/8 - 9-1/4	6-3/16	33-1/4	15-1/4	15-11/16	29-1/2	33-1/2	†	5-1/8	7-1/2	6-3/16	8-1/8	7-3/16	3-13/16
14630	9-3/8 - 10 1/4	9-1/8 - 10-1/4	7-3/16	34-1/4	16-1/4	15-11/16	30-5/8	34-5/8	†	6-1/8	8-1/2	7-3/16	9-1/8	8-3/16	4-5/16
14635	10-3/8 - 11-7/8	10-1/8 - 11-7/8	8-1/16	35-7/8	17-7/8	15-5/8	32-1/8	37-1/8	†	6-1/2	9-3/8	8-1/16	10-1/8	9-3/8	5
14640	11-3/4 - 14-1/4	11-1/4 - 14-1/4	9-1/16	37-5/16	19-1/16	15-13/16	33-5/16	38-5/16	†	7-1/4	10-3/8	9-1/16	11-1/4	10-7/16	5-3/16
14645	12-5/8 - 15	12-1/4 - 15	10-1/16	44-5/8	22-5/8	19-9/16	40-3/8	50-1/8	†	7-1/2	11-3/8	10-1/16	12-1/4	11-3/8	6
14650	14-3/4 - 18	14-1/2 - 18	12-1/16	50-3/4	26-3/4	21	46	52-1/4	†	9-1/4	13-3/4	12-1/16	14-1/2	13-5/8	7

* Flush from Shoe to Sub

† Length to order, specify box or pin connection.

Specifications

Hole Size		3-3/4 to 4-1/8	4-1/4 to 4-1/2	4-5/8 to 5	4-5/8 to 5	5-1/8 to 5-1/2	5-3/8 to 6	5-5/8 to 6	6-1/8 to 6-1/2	6-1/8 to 6-1/2
O.D. Barrel (Top End)		3-5/8	3-3/4	3-7/8	3-7/8	4-1/4	5-1/8	4-3/4	5-3/4	5-1/8
O.D. Shoe (Top End)		3-5/8	4-1/16	4-1/2	4-1/2	4-7/8	5-1/8	5-3/8	5-3/4	5-7/8
Maximum Diameter of Fish		2-11/16	2-15/16	3-9/32	3-3/8	3-23/32	3-25/32	4-1/16	413/32	4-5/16
Number of Teeth		8	8	8	8	8	8	8	8	8
Complete Assembly	Part No.	14590	14586	14595	19375	14600	2618	14605	59996	14610
	Weight	55	60	65	65	80	80	100	200	110

Replacement Parts

Top Sub	Part No.	14725	14726	14727	14727	14728	2619	14729	59997	14730
	Weight	20-1/2	21-1/2	22	22	23-1/8	23	29-1/2	42	30-1/2
Barrel	Part No.	14591	14587	14596	19376	14601	2620	14606	15134	14611
	Weight	2528	32	31	40	40	48	48	55	
Upper Catcher	Part No.	—	—	—	—	—	—	14607-W	15130-W	14612-W
	Weight	—	—	—	—	—	—	3	3	3
Lower Catcher	Part No.	14593-W	14589-W	14598-W	19377-W	14603-W	21735-W0	14608-W	28349-W	14613-W
	Weight	1-1/2	1-1/2	2	2	2-1/2	2-1/2	3	3	
Conventional Shoe	Part No.	14594-A	14574-A	14599-A	19378-A	14604-A	2625-A	14609-A	2676-A	14614-A
Type A (Hard-Faced)	Weight	8	8	14	10	14	16	16	18-1/2	18-1/2

Mill Shoes - Extra

Mill Shoe Type B	Part No.	14954-B	14574-B	14599-B	19378-B	14604-B	2625-B	14609-B	2676-B	14614-B
(Itcoloy-Faced)	Weight	10	10	12	12	16	18	18	22	22
Mill Shoe Type C	Part No.	14594-C	14574-C	14599-C	19378-C	14604-C	2625-C	14609-C	2676-C	14614-C
(Itcoloy-Faced)	Weight	12	12	14	14	18	25	25	30	30

Finger Shoes - Extra

To Fit Basket Number		14590	14586	14595	19375	14600	2618	14605	2670	14610
Maximum Diameter of Fish		3-1/4	3-13/16	4-1/16	4-1/16	4-1/2	4-1/2	4-3/4	5-1/4	5-3/8
Replacement	Part No.	22203	22206	22207	22207	22208	22208	22209	22218	19406
	Weight	6	8	10	10	12	12	16	18	20

Finger Shoe replacement is furnished with the same O.D. as the standard shoe unless otherwise specified.

Magnet Inserts - Extra

To Fit Basket Number		14590	14586	14595	19375	14600	2618	14605	2670	14610
Total Pull in Lbs.		45 – 55	45 – 55	80 – 100	80 – 100	80 – 100	80 – 100	180 – 205	180 – 205	180 – 205
Complete Assembly	Part No.	61842-M	61838-M	61858-M	61858-M	61852-M	61852-M	61862-M	61866-M	62637-M
	Weight	16	16-1/2	29	29	32	32	55	55	55
Adapter	Part No.	M-61843	M-61839	M-61859	M-61859	M-61853	M-61853	M-61863	M-61867	M-62638
	Weight	2	21/2	3	3	4	4	8	8	8
Magnetic Assembly	Part No.	M-61812	M-61812	M-61814	M-61814	M-61814	M-61814	M-61816	M-61816	M-61816
	Weight	14	14	26	26	28	28	47	47	47

It is recommended that Shoes be at least 1/8" over the Barrel size.

How to Order

Specify:

- (1) Name and number of assembly or part
- (2) O.D. and type of shoe
- (3) Top connection, if other than standard

RECOMMENDED SPARE PARTS:

- (1) 2 Upper Catchers
- (2) 2 Lower Catchers
- (3) 3 Mill Shoes
- (4) 2 Finger Shoes
- (5) 4 Finger Shoe Replacements

Specifications

Hole Size		6-1/8 – 6-1/2	6-5/8 – 7	7-1/4 – 8	8-1/4 – 9	9-1/4 – 10-1/8	10-1/4 – 11-5/8	11-3/4 – 12-1/2	12-5/8 – 15	15 – 20
O.D. Barrel (Top End)		5-1/4	5-3/4	6-1/2	7-1/2	8-1/2	9-3/8	10-3/8	11-3/8	13-3/4
O.D. Shoe (Top End)		5-7/8	6-1/4	7-1/8	8-1/8	9-1/8	10-1/8	11-1/4	12-1/4	14-1/2
Maximum Diameter of Fish		4-1/2	4-13/16	5-7/16	6-3/16	7-3/16	8-1/16	9-1/16	10-1/16	12-1/16
Number of Teeth		8	8	8	8	10	12	12	12	16
Complete Assembly	Part No.	19379	14615	14620	14625	14630	14635	14640	14645	14650
	Weight	110	125	160	205	255	290	360	450	655

Replacement Parts

Top Sub	Part No.	19380	14731	14732	14733	14734	14735	14736	14737	14738
	Weight	30-1/2	42	53	67	86	94	128	140	155
Barrel	Part No.	19381	14616	14621	14626	14631	14636	14641	14646	14651
	Weight	55	55	68	85	102	117	134	170	265
Upper Catcher	Part No.	19382-W	14617-W	14622-W	14627-W	14632-W	14637-W	14642-W	14647-W	14652-W
	Weight	3	4	5	7	8	12	14	20	30
Lower Catcher	Part No.	19383-W	14618-W	14623-W	14628-W	14633-W	14638-W	14643-W	14648-W	14653-W
	Weight	3	4	5	7	8	12	14	20	30
Conventional Shoe	Part No.	19384-A	14619-A	14624-A	14629-A	14634-A	14639-A	14644-A	14649-A	14654-A
Type A (Hard-Faced)	Weight	181/2	20	28	38	49	55	70	100	175

Mill Shoes - Extra

Mill Shoe Type B	Part No.	19384-B	14619-B	14624-B	14629-B	14634-B	14639-B	14644-B	14649-B	14654-B
(Itcoloy Faced)	Weight	22	25	34	44	56	62	72	110	190
Mill Shoe Type C	Part No.	19384-C	14619-C	14624-C	14629-C	14634-C	14639-C	14644-C	14649-C	14654-C
(Itcoloy Faced)	Weight	30	33	43	51	66	72	82	125	215

Finger Shoes - Extra

To Fit Basket Number		19379	14615	14620	14625	14630	14635	14640	14645	14650
Maximum Diameter of Fish		51/2	529/32	61/2	71/4	81/8	915/16	11	117/8	151/4
Replacement	Part No.	19406	22210	22211	22212	22213	22214	22215	22216	22217
	Weight	20	28	29	37	45	64	71	89	160

Finger Shoe replacement is furnished with the same O.D. as the standard shoe unless otherwise specified.

Magnet Inserts - Extra

To Fit Basket Number		19379	14615	14620	14625	14630	14635	14640	14645	14650
Total Pull in lbs.		180-205	250-290	310-360	425-495	620-720	930-1080	1265-1440	1265-1440	1740-2050
Complete Assembly	Part No.	61868-M	61874-M	61949-M	61955-M	61959-M	61969-M	61977-M	61979-M	61987-M
	Weight	59	77	98	120	182	268	331	353	467
Adapter	Part No.	M-61869	M-61875	M-61950	M-61956	M-61960	M-61970	M-61978	M-61980	M-61988
	Weight	12	14	19	24	32	47	65	87	113
Magnetic Assembly	Part No.	M-61816	M-61818	M-61822	M-61824	M-61826	N-61828	N-61830	N-61830	P-61834
	Weight	47	63	79	96	150	221	266	266	354

How to Order

Specify:

- (1) Name and number of assembly or part
- (2) O.D. and type of shoe
- (3) Top connection, if other than standard

RECOMMENDED SPARE PARTS:

- (1) 2 Upper Catchers
- (2) 2 Lower Catchers
- (3) 3 Mill Shoes
- (4) 2 Finger Shoes
- (5) 4 Finger Shoe Replacements

Catcher Specifications

Will Fit Junk Basket Number:												
Single Catcher	—	14590	7724	14586	—	7453	14595	—	7731	—	—	
Upper Catcher	—	—	—	—	—	—	—	10995	—	—	—	
Lower Catcher	—	—	—	—	—	—	—	—	10995	—	—	
Catcher Dimensions:												
Internal Diameter	1-3/4	2-23/32	24964	2-31/32	3-1/16	3-1/16	39/32	3-13/32	3-13/32	3-13/32	3-13/32	
External Diameter	2.075	31564	3-11/16	3-13/16	3-13/16	4	3-31/32	3-31/32	4-1/16	4-1/16	4-9/32	
Height	1-3/4	1-7/8	1-7/8	2-1/4	2-1/2	2-1/2	2-3/8	1-63/64	1-63/64	2-3/8	2-1/4	
Complete Assembly	Part No.	11270-W	14593-W	21810-W	14589-W	22075-W	21780-W	14598-W	21880-W	21805-W	19377-W	18940-W
	Weight	7/8	1	7/8	1-1/2	2	2	1-3/4	1-3/8	1-3/8	1-3/4	1-3/4

Replacement Parts

Body	Part No.	42230	45541	45542	45590	45591	45591	45568	45565	45565	45563	45579
	Weight	1/2	3/4	5/8	1-1/8	1-1/2	1-1/2	1-1/4	1	1	1-1/4	1-1/4
Finger Retainer	Part No.	42253	45543	45538	45562	45592	45592	45569	45566	45566	45564	45580
	Weight	1/8	1/8	1/8	1/8	3/16	3/16	3/16	1/8	1/8	3/16	3/16
Short Finger	Part No.	42254	45539	45539	45574	45574	45574	55962	45574	45574	55962	45581
	Code	E	E	W-3	W-3	W-3	690-W	W-3	W-3	W-3	610-W	W-1
	Weight	1/32	1/32	1/32	1/32	1/16	1/16	1/16	1/32	1/32	1/16	1/16
	Req'd	8	5	5	5	10	5	6	12	6	6	6
Long Finger	Part No.	—	45540	45540	45575	—	45575	55963	—	45575	55963	45582
	Code	—	F	F	W-4	—	W-4	691-W	—	W-4	691-W	W-2
	Weight	—	1/16	1/16	1/16	—	1/8	1/8	—	1/16	1/8	1/8
	Req'd	—	5	5	5	—	5	6	—	6	6	6
Pivot Pin	Part No.	42255	45535	45535	45583	45583	45583	55957	45583	45583	55957	55957
	Weight	1/32	1/32	1/32	1/32	1/32	1/32	1/32	1/32	1/32	1/32	1/32
	Req'd	8	10	10	10	10	10	12	12	12	12	12
Torsion Spring	Part No.	42256	45567	45567	55958	45571	45571	55958	45571	45571	55958	45571
	Weight	1/32	1/32	1/32	1/32	1/32	1/32	1/32	1/32	1/32	1/32	1/32
	Req'd	8	10	10	10	10	10	12	12	12	12	12
Retainer Screw	Part No.	42257	42257	42257	42257	42257	42257	42257	42257	42257	42257	42257
	Weight	1/32	1/32	1/32	1/32	1/32	1/32	1/32	1/32	1/32	1/32	1/32
	Req'd	2	2	2	2	2	2	2	2	2	2	2
Top Cap	Part No.	42252	—	—	—	—	—	—	—	—	—	—
	Weight	1/16	—	—	—	—	—	—	—	—	—	—

Code

Each Finger is stenciled with a Letter or Letter-Number Code. These Codes are used in lieu of the Part Number because of space limitations on small Fingers. The Code Numbers indicate Part Numbers as follows.

Code	Part No.	Code	Part No.	Code	Part No.	Code	Part No.
A	45516	I	45561	P-1	45588	21778-W	45607
B	45517	J	45507	P-2	45589	21779-W	45608
C	45518	K	45508	W-1	45581	362-W	362
D	—	L	45510	W-2	45582	363-W	363
E	45539	M	45525	W-3	45574	690-W	45623
F	45540	N	45526	W-4	45575	691-W	45624
G	45557	O	—	X-1	45597	666-W	666
H	45558	P	—	X-2	45598	667-W	667

How to Order

Specify:

- (1) Name and number of assembly or part
- (2) Finger number and code when ordering Fingers

RECOMMENDED SPARE PARTS:

- (1) 2 Sets Fingers
- (2) 4 Sets Torsion Springs
- (3) 1 Set Pivot Pins
- (4) 4 Retainer Screws

Catcher Specifications

Will Fit Junk Basket Number:											
Single Catcher	—	5516	—	—	—	—	—	7737	—	—	12097
		2168						7441			7441
								2570			
Upper Catcher	2618	—	—	—	—	14605	—	—	14610	2670	—
Lower Catcher	—	12109	—	2618	14605	—	—	12139	—	—	2670
Catcher Dimensions:											
Internal Diameter	3-3/4	3-3/4	3-3/4	3-3/4	4-1/16	4-1/16	4-1/16	4-3/32	4-5/16	3-13/32	4-13/32
External Diameter	4-15/32	4-15/32	4-15/32	4-15/32	4-7/8	4-7/8	4-7/8	4-3/4	5-5/16	4-1/16	5-5/32
Height	29/16	29/16	2-9/16	2-9/16	2-25/32	2-25/32	1-9/16	2-1/2	2-7/8	2-13/16	2-13/16
Complete Assembly	Part No.	14747-W	21735-W	31043-W	14603-W	14608-W	14607-W	21960-W	21820-W	14612-W	15130-W
	Weight	2	2-1/2	2-1/2	2-3/4	3-1/4	3	2	2-1/2	4-1/8	3-1/4

Replacement Parts

Body	Part No.	45559	45559	45559	45559	45555	45555	45600	45595	45572	45511	45511
	Weight	1-1/2	1-3/4	1-3/4	1-7/8	2	1-3/4	1-1/2	1-3/4	2-1/2	2	2-1/4
Finger Retainer	Part No.	45560	45560	45560	45560	45556	45556	45556	45596	45573	45519	45519
	Weight	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4
Short Finger	Part No.	45558	45558	45558	45558	45558	45558	45558	45597	45517	45517	45517
	Code	H	H	H	H	H	H	H	X-1	B	B	R
	Weight	1/16	1/16	1/16	1/16	1/16	1/16	1/16	1/16	1/16	1/16	1/16
	Req'd	10	5	10	5	6	12	12	6	1212	8	
Long Finger	Part No.	—	45561	—	45561	45557	—	—	45598	—	—	45516
	Code	—	I	—	I	G	—	—	X-2	—	—	A
	Weight	—	1/8	—	1/8	1/8	—	—	1/8	—	—	1/8
	Req'd	—	5	—	5	6	—	—	6	—	—	4
Pivot Pin	Part No.	—	—	—	—	—	—	—	45599	—	—	—
	Weight	—	—	—	—	—	—	—	1/32	—	—	—
	Req'd	—	—	—	—	—	—	—	12	—	—	—
Torsion Spring	Part No.	45520	45520	45520	45520	45520	45520	45520	45571	45520	45520	45520
	Weight	1/32	1/32	1/32	1/32	1/32	1/32	1/32	1/32	1/32	1/32	1/32
	Req'd	10	10	10	10	12	12	12	12	12	12	12
Retainer Screw	Part No.	42257	42257	42257	42257	42257	42257	42257	42257	42257	42257	42257
	Weight	1/32	1/32	1/32	1/32	1/32	1/32	1/32	1/32	1/32	1/32	1/32
	Req'd	—	2	2	2	2	2	2	2	2	2	2
Top Cap	Part No.	—	—	—	—	—	—	—	—	—	—	—
	Weight	—	—	—	—	—	—	—	—	—	—	—

Code

Each Finger is stenciled with a Letter or Letter-Number Code. These Codes are used in lieu of the Part Number because of space limitations on small Fingers. The Code Numbers indicate Part Numbers as follows.

Code	Part No.	Code	Part No.	Code	Part No.	Code	Part No.
A	45516	I	45561	P-1	45588	21778-W	45607
B	45517	J	45507	P-2	45589	21779-W	45608
C	45518	K	45508	W-1	45581	362-W	362
D	—	L	45510	W-2	45582	363-W	363
E	45539	M	45525	W-3	45574	690-W	45623
F	45540	N	45526	W-4	45575	691-W	45624
G	45557	O	—	X-1	45597	666-W	666
H	45558	P	—	X-2	45598	667-W	667

How to Order

Specify:

- (1) Name and number of assembly or part
- (2) Finger number and code when ordering Fingers

RECOMMENDED SPARE PARTS:

- (1) 2 Sets Fingers
- (2) 4 Sets Torsion Springs
- (3) 1 Set Pivot Pins
- (4) 4 Retainer Screws

Catcher Specifications

Will Fit Junk Basket Number:											
Single Catcher	—	—	6109	—	—	—	—	5895	—	—	—
			7318					7072			
			2677					2554			
Upper Catcher	19379	—	—	—	14615	—	—	—	—	14620	—
										19385	
Lower Catcher	—	19379	—	—	—	14615	—	—	—	—	14620
											19385
Catcher Dimensions:											
Internal Diameter	4-17/32	4-17/32	4-3/4	4-3/4	4-13/16	4-13/16	5-3/16	5-3/16	5-1/4	5-7/16	5-7/16
External Diameter	5-13/32	5-13/32	5-5/8	5-5/8	5-23/32	5-23/32	6-1/4	6-1/4	6-1/8	6-3/8	6-3/8
Height	2-7/8	2-7/8	2-5/8	2-5/8	3-1/16	3-1/16	3-5/16	3-5/16	2-3/4	3-5/16	3-5/16
Complete Assembly	Part No.	19382-W	19383-W	21750-W	22045-W	14617-W	14618-W	22050-W	21725-W	22030-W	14622-W
	Weight	4	4	4-1/4	4-1/4	4-1/2	5	5-1/4	5-1/4	4-3/4	6

Replacement Parts

Body	Part No.	45553	45553	45584	45584	45512	45512	45550	45550	45601	45545	45545
	Weight	2-1/2	2-1/2	2-3/4	2-3/4	2-7/8	3	3-1/8	3-1/8	2-5/8	3-1/4	3-1/4
Finger Retainer	Part No.	45554	45554	45585	45585	45552	45552	45551	45551	45527	45546	45546
	Weight	3/8	3/8	3/8	3/8	3/8	3/8	1/2	1/2	1/2	1/2	1/2
Short Finger	Part No.	45517	45517	45517	45517	45517	45517	45557	45557	45517	45517	45517
	Code	B	B	B	B	B	G	G	B	B	B	B
	Weight	1/16	1/16	1/16	1/16	1/16	1/16	1/16	1/16	1/8	1/8	1/8
	Req'd	12	6	6	12	12	6	12	6	12	14	7
Long Finger	Part No.	—	45516	45516	—	—	45516	—	45518	—	—	45518
	Code	—	A	A	—	—	A	—	C	—	—	C
	Weight	—	1/8	1/8	—	—	1/8	—	3/16	—	—	3/16
	Req'd	—	6	6	—	—	6	—	6	—	—	7
Pivot Pin	Part No.	—	—	—	—	—	—	—	—	—	—	—
	Weight	—	—	—	—	—	—	—	—	—	—	—
Torsion Spring	Part No.	45520	45520	45520	45520	45520	45520	45520	45520	45520	45520	45520
	Weight	—	1/32	1/32	1/32	1/32	1/32	1/32	1/32	1/32	1/32	1/32
	Req'd	12	12	12	12	12	12	12	12	12	14	14
Retainer Screw	Part No.	42257	42257	42257	42257	42257	42257	42257	42257	42257	42257	42257
	Weight	—	1/32	1/32	1/32	1/32	1/32	1/32	1/32	1/32	1/32	1/32
	Req'd	2	2	2	2	2	2	2	2	2	2	2
Top Cap	Part No.	—	—	—	—	—	—	—	—	—	—	—
	Weight	—	—	—	—	—	—	—	—	—	—	—

Code

Each Finger is stenciled with a Letter or Letter-Number Code. These Codes are used in lieu of the Part Number because of space limitations on small Fingers. The Code Numbers indicate Part Numbers as follows.

Code	Part No.	Code	Part No.	Code	Part No.	Code	Part No.
A	45516	I	45561	P-1	45588	21778-W	45607
B	45517	J	45507	P-2	45589	21779-W	45608
C	45518	K	45508	W-1	45581	362-W	362
D	—	L	45510	W-2	45582	363-W	363
E	45539	M	45525	W-3	45574	690-W	45623
F	45540	N	45526	W-4	45575	691-W	45624
G	45557	O	—	X-1	45597	666-W	666
H	45558	P	—	X-2	45598	667-W	667

How to Order

Specify:

- (1) Name and number of assembly or part
- (2) Finger number and code when ordering Fingers

RECOMMENDED SPARE PARTS:

- (1) 2 Sets Fingers
- (2) 4 Sets Torsion Springs
- (3) 1 Set Pivot Pins
- (4) 4 Retainer Screws

Catcher Specifications

Will Fit Junk Basket Number:

Single Catcher	—	7751 7010	6228 7567	—	—	7754 7015 13003	—	—	—	—	—	
Upper Catcher	10880	—	—	—	14625 19388	—	—	14630	1100	—	—	
Lower Catcher	—	10880	—	14625 19388	—	10885	14630 19391	—	—	11005	—	
Catcher Dimensions:												
Internal Diameter	5-5/8	5-5/8	6	6-3/16	6-3/16	6-1/2	7-3/16	7-3/16	7-3/16	7-13/16	8-5/16	
External Diameter	6-19/32	6-19/32	7	7-1/8	7-1/8	7-7/16	8-1/8	8-1/8	8-1/8	9-1/32	9-3/4	
Height	2-7/8	3-5/8	3-7/16	3-13/16	3-13/16	3-1/2	4-5/16	4-5/16	3-3/8	4-5/8	5	
Complete Assembly	Part No.	21865-W	18936-W	18725-W	14628-W	14627-W	18720-W	14633-W	14632-W	21885-W	18945-W	31046-W
	Weight	5-1/2	6-3/4	7	7-1/4	7-1/4	7-1/2	9-1/4	9-1/4	8	10	17-1/4

Replacement Parts

Body	Part No.	45602	45514	45505	45547	45547	45515	45521	45521	45504	45522	45576
	Weight	3	3-3/4	4	4-1/4	4-1/4	4-1/2	4-1/2	4-1/2	3-1/4	5-1/4	10-1/4
Finger Retainer	Part No.	45528	45528	45506	45548	45548	45529	45530	45530	45530	45531	45578
	Weight	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1
Short Finger	Part No.	45517	45517	45508	47670	47670	45508	45588	45588	45588	45507	45525
	Code	B	B	K	362-W	362-W	K	P-1	P-1	P-1	J	M
	Weight	1/8	1/8	1/8	1/8	1/8	1/8	3/16	3/16	3/16	3/16	1/4
	Req'd	12	6	6	6	12	6	6	12	12	6	16
Long Finger	Part No.	—	45518	45507	47669	—	45507	45589	—	—	70277	—
	Code	—	C	J	363-W	—	J	P-2	—	—	N	—
	Weight	—	3/16	3/16	3/16	—	3/16	1/4	—	—	1/4	—
	Req'd	—	6	6	6	—	6	6	—	—	6	—
Pivot Pin	Part No.	—	—	—	45536	45536	—	—	—	—	—	—
	Weight	—	—	—	1/16	1/16	—	—	—	—	—	—
Torsion Spring	Part No.	45520	45520	45509	45537	45537	45509	45549	45549	45509	45509	45509
	Weight	1/32	1/32	1/16	1/16	1/16	1/16	1/8	1/8	1/8	1/8	1/8
	Req'd	12	12	12	12	12	12	12	12	12	12	16
Retainer Screw	Part No.	42257	42257	42257	42257	42257	42257	42257	42257	42257	42257	42257
	Weight	1/32	1/32	1/32	1/32	1/32	1/32	1/32	1/32	1/32	1/32	1/32
	Req'd	2	2	2	2	2	2	2	2	2	2	2

Code

Each Finger is stenciled with a Letter or Letter-Number Code. These Codes are used in lieu of the Part Number because of space limitations on small Fingers. The Code Numbers indicate Part Numbers as follows.

Code	Part No.	Code	Part No.	Code	Part No.	Code	Part No.
A	45516	I	45561	P-1	45588	21778-W	45607
B	45517	J	45507	P-2	45589	21779-W	45608
C	45518	K	45508	W-1	45581	362-W	362
D	—	L	45510	W-2	45582	363-W	363
E	45539	M	45525	W-3	45574	690-W	45623
F	45540	N	45526	W-4	45575	691-W	45624
G	45557	O	—	X-1	45597	666-W	666
H	45558	P	—	X-2	45598	667-W	667

How to Order

Specify:

- (1) Name and number of assembly or part
- (2) Finger number and code when ordering Fingers

RECOMMENDED SPARE PARTS:

- (1) 2 Sets Fingers
- (2) 4 Sets Torsion Springs
- (3) 1 Set Pivot Pins
- (4) 4 Retainer Screws

Catcher Specifications

Will Fit Junk Basket Number:							
Single Catcher	—	—	—	—	—	2708	—
Upper Catcher	—	—	14640	—	14645	—	—
Lower Catcher	—	—	—	14645	—	—	—
Catcher Dimensions:							
Internal Diameter	8-5/16	8-11/16	9-1/8	10-1/8	10-1/8	1-13/16	1-13/16
Height	4-1/2	5-3/32	5-3/16	6	6	7-5/16	7-5/16
Complete Assembly	Part No.	22000-W	31047-W	14642-W	14648-W	14647-W	21775-W
	Weight	15-3/4	17	19-1/4	24-1/2	24-3/4	29

Replacement Parts

Body	Part No.	45577	45593	45524	45586	45586	45605	45605
	Weight	8-3/4	10	12	17	17-1/4	16-1/2	16-1/2
Finger Retainer	Part No.	45578	45594	45533	45587	45587	45606	45606
	Weight	1	1	1-1/4	1-1/2	1-1/2	1-3/4	1-3/4
Short Finger	Part No.	45525	45507	45507	666	666	45607	45607
	Code	M	J	J	666-W	666-W	21778-W	21778-W
	Weight	1/4	3/16	3/16	1/4	1/4	5/16	5/16
	Req'd	16	16	16	8	16	7	14
Long Finger	Part No.	—	—	—	667	—	45608	—
	Code	—	—	—	667-W	—	21779-W	—
	Weight	—	—	—	5/16	—	3/8	—
	Req'd	—	—	—	8	—	7	—
Pivot Pin	Part No.	—	—	—	45603	45603	45609	45609
	Weight	—	—	—	1/8	1/8	3/16	3/16
	Req'd	—	—	—	16	16	14	14
Torsion Spring	Part No.	45509	45509	45509	45604	45604	45610	45610
	Weight	1/8	1/8	1/8	3/16	3/16	1/4	1/4
	Req'd	16	16	16	16	16	14	14
Retainer Screw	Part No.	42257	42257	42257	42257	42257	42257	42257
	Weight	1/32	1/32	1/32	1/32	1/32	1/32	1/32
	Req'd	2	2	2	2	2	2	2

Code

Each Finger is stenciled with a Letter or Letter-Number Code. These Codes are used in lieu of the Part Number because of space limitations on small Fingers. The Code Numbers indicate Part Numbers as follows.

Code	Part No.	Code	Part No.	Code	Part No.	Code	Part No.
A	45516	I	45561	P-1	45588	21778-W	45607
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C	45518	K	45508	W-1	45581	362-W	362
D	—	L	45510	W-2	45582	363-W	363
E	45539	M	45525	W-3	45574	690-W	45623
F	45540	N	45526	W-4	45575	691-W	45624
G	45557	O	—	X-1	45597	666-W	666
H	45558	P	—	X-2	45598	667-W	667

How to Order

Specify:

- (1) Name and number of assembly or part
- (2) Finger number and code when ordering Fingers

RECOMMENDED SPARE PARTS:

- (1) 2 Sets Fingers
- (2) 4 Sets Torsion Springs
- (3) 1 Set Pivot Pins
- (4) 4 Retainer Screws

Catcher Specifications

Will Fit Junk Basket Number:						
Single Catcher	—	7747	—	11292	—	—
		7005		2690		
Upper Catcher	—	14635	—	—	—	—
Lower Catcher	14610	—	14635	—	11010	14640
Catcher Dimensions:						
Internal Diameter	4-5/16	5-1/4	8-1/16	8-3/16	8-11/16	9-1/8
External Diameter	5-5/16	6-1/8	9-5/16	9-3/4	10-3/32	10-7/16
Height	2-7/8	3-5/16	5	5	5-3/32	5-3/16
Complete Assembly	Part No.	14613-W	18935-W	14638-W	21760-W	21840-W
	Weight	4-1/4	5-1/4	15-1/2	18-1/4	19-1/4

Replacement Parts

Body	Part No.	45572	45513	45523	45576	45593	45524
	Weight	2-3/4	3	8-1/2	11-1/4	12	12
Finger Retainer	Part No.	45573	45527	45532	45578	45594	45533
	Weight	3/8	1/2	1	1	1-1/4	1-1/8
Short Finger	Part No.	45517	45517	45525	45525	45507	45507
	Code	B	B	M	M	J	J
	Weight	1/16	1/16	3/16	3/16	3/16	3/16
	Req'd	6	6	8	8	8	8
Medium Finger	Part No.	45557	45516	45507	45510	45510	45510
	Code	G	A	J	L	L	L
	Weight	3/32	3/32	1/4	1/4	1/4	1/4
	Req'd	3	3	4	4	4	4
Long Finger	Part No.	45516	45518	68295	45526	45526	45526
	Code	A	C	N	N	N	N
	Weight	1/8	1/8	5/16	5/16	5/16	5/16
	Req'd	3	3	4	4	4	4
Torsion Spring	Part No.	45520	45520	45509	45509	45509	45509
	Weight	1/32	1/32	1/16	1/16	1/16	1/16
	Req'd	12	12	16	16	16	16
Retainer Screw	Part No.	42257	42257	42257	42257	42257	42257
	Weight	1/32	1/32	1/32	1/32	1/32	1/32
	Req'd	2	2	2	2	2	2

Code

Each Finger is stenciled with a Letter or Letter-Number Code. These Codes are used in lieu of the Part Number because of space limitations on small Fingers. The Code Numbers indicate Part Numbers as follows.

Code	Part No.	Code	Part No.	Code	Part No.	Code	Part No.
A	45516	I	45561	P-1	45588	21778-W	45607
B	45517	J	45507	P-2	45589	21779-W	45608
C	45518	K	45508	W-1	45581	362-W	362
D	—	L	45510	W-2	45582	363-W	363
E	45539	M	45525	W-3	45574	690-W	45623
F	45540	N	45526	W-4	45575	691-W	45624
G	45557	O	—	X-1	45597	666-W	666
H	45558	P	—	X-2	45598	667-W	667

How to Order

Specify:

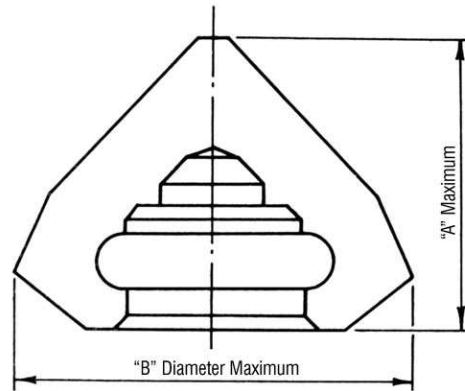
- (1) Name and number of assembly or part
- (2) Finger number and code when ordering Fingers

RECOMMENDED SPARE PARTS:

- (1) 2 Sets Fingers
- (2) 4 Sets Torsion Springs
- (3) 1 Set Pivot Pins
- (4) 4 Retainer Screws

Rock Bit Cone Dimensions

2-Cone Bits		Size	3-Cone Bits	
A	B		A	B
—	—	3-3/4 – 4-1/8	13-1/32	24-5/64
—	—	4-1/4 – 4 1/2	2-13/64	2-59/64
—	—	4-5/8 – 5-21/32	3-13/64	—
—	—	5-1/8 – 5-1/2	2-41/64	3-17/64
—	—	5-5/8 – 6	3-1/8	4-1/64
—	—	6-1/8 – 6-1/2	3-7/64	4-3/16
—	—	6-5/8 – 7	3-7/16	4-9/16
—	—	7-1/8 – 7-1/2	3-45/64	4-27/32
3-45/64	5-17/32	7-5/8 – 8	3-31/32	5-17/64
4-11/32	6-7/64	8-1/8 – 8-1/2	4-3/8	5-25/32
4-11/32	6-5/16	8-5/8 – 9	4-17/32	6-1/32
—	—	9-1/8 – 9-1/2	4-9/16	6-13/32
4-7/8	7	9-5/8 – 9-7/8	4-15/16	6-41/64
5-23/64	7-19/32	10-1/2 – 11-1/2	5-27/64	7-5/32
5-63/64	8-27/64	11-3/4 – 12-1/2	6-1/8	7-61/64
—	—	12-5/8 – 13 1/8	6-5/16	8-31/64
—	—	13-1/2 – 14-1/4	7-1/32	8-13/16
—	—	14-1/2 – 15	7-25/64	9-19/32
—	—	16	9-27/32	10-1/8
—	—	17 – 17-1/2	8-13/64	11-11/64
—	—	18-1/2 – 18-7/8	8-25/32	11-23/64
—	—	20	9-1/2	11-7/8
—	—	22	10-15/32	14-1/64
—	—	24	10-15/16	14-9/16
—	—	26	12-19/64	14-31/64



The cone sizes shown are the nominal Hughes Christensen cone dimensions and are the maximum for the size indicated in the middle column. They may be used as a guide in junk fishing operations.

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* Denotes Manufacturing and Engineering facilities

Downhole Solutions
Drilling Solutions
Engineering and Project Management Solutions
Lifting and Handling Solutions
Production Solutions
Supply Chain Solutions
Tubular and Corrosion Control Solutions
Well Service and Completion Solutions